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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/084,776	02/25/2002	Mario J. Paniccia	042390P13867	1198

7590 08/07/2003

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EXAMINER	
VALENCIA, DANIEL E	
ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 08/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/084,776	Applicant(s) PANICCIA, MARIO J.
	Examiner Daniel E Valencia DV	Art Unit 2874

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-30 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-30 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 25 February 2002 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Drawings

New corrected drawings are required in this application because the application has been filed with informal drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Claim Objections

Claim 23 is objected to because of the following informalities: Line 11 of the claim recites "coupled to receive the a plurality of optical beams". Examiner is of the opinion that this is a typographical error and should read "a plurality of optical signals". Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 5-8, 10, 12-14, 17, 19, 22, 24-26, 28, and 30 are rejected under 35 U.S.C. 102(e) as being anticipated by Lundqvist U.S. Patent Application Publication No. 2003/0021305 A1. Refer to the appropriate drawings or parts of the specification. Lundqvist discloses a tunable semiconductor laser with integrated wideband reflector with all the limitations of the abovementioned claims. Regarding claims 1, 19, and part of 25, Lundqvist discloses an apparatus (fig. 1-7), comprising: a gain medium (202) disposed in a semiconductor substrate (210); a tunable Bragg grating (214) disposed in the semiconductor substrate, the tunable Bragg grating optically coupled to the gain medium so as to tune an output wavelength of an optical beam generated from the gain medium; and an optical modulator (paragraph 49) disposed in the semiconductor substrate, the optical modulator optically coupled to receive the optical beam, the optical modulator to modulate the optical beam generated from the gain medium in response to a modulation signal. Regarding claims 5 and 6, the device disclosed in Lundqvist would inherently function as a InP diode (paragraph 36). Lundqvist discloses that the gain medium and the Bragg grating define a laser cavity disposed in the semiconductor cavity (paragraph 31), wherein the gratings comprises a plurality of perturbations (114) of a refractive index of the semiconductor substrate, as explained in claims 7 and 8. With reference to claims 10 and 30, Lundqvist shows that a plurality of perturbations of the refractive index of the semiconductor substrate are provided with periodic changes in the geometry of the tunable Bragg grating (fig. 3 and 4). Regarding claims 12 and 24, Lundqvist discloses that the Bragg grating comprises electrodes (226, 222, 228, 224, 220) disposed in the semiconductor substrate of the tunable Bragg grating to modulate

a charge concentration in the semiconductor substrate responsive to the charge concentration in the tunable Bragg grating. Lundqvist discloses a multiplexer (fig. 9, 906 and paragraphs 59 and 60) optically coupled to an output modulator so as to multiplex the optical beam generated from the gain medium with a plurality of other optical beams, as described by claims 13, 22, and part of 25. As to claim 14, Lundqvist discloses a splitter optically coupled to receive the optical beam, the optical splitter (918) to split the optical beam into a plurality of optical beams. Referring to claim 17, Lundqvist shows that the gain medium (fig. 8, 102) is disposed in the semiconductor substrate between the tunable Bragg grating (114) and the optical modulator (130). Lundqvist further discloses a demultiplexer (fig. 9, 918) optically coupled to receive the WDM optical beam back into the plurality of optical beams; and a plurality of optical receivers (920), each of the optical receivers optically coupled to receive a respective one of the plurality of optical beams, as mentioned in the final part of claim 25. With regards to claim 26, Lundqvist shows that the gain medium is one of a plurality of gain mediums (fig. 9 and paragraphs 59-60) disposed in the semiconductor substrate, each one of the plurality of gain mediums (904) generating a respective one of the plurality of optical beams generated in the semiconductor substrate, the tunable Bragg grating one of a plurality of tunable Bragg gratings (904) disposed in the semiconductor substrate, each one of the plurality of tunable Bragg gratings optically coupled to respective one of the plurality of gain mediums so as to tune a respective output wavelength of the respective one of the plurality of optical beams, the optical modulator (904) one of a plurality of optical modulators disposed in the semiconductor substrate, each one of the

plurality of optical modulators optically coupled to a respective one of the plurality of optical beams so as to modulate the respective one of the plurality of optical beams in response to a respective modulation signal, as explained in claim 26. As to claim 28, figure 9 shows that the multiplexer is included on the substrate.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 3, 21, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lundqvist in view of Hung U.S. Patent No. 6,330,255. Refer to the appropriate drawings or parts of the specification. Lundqvist as applied above, discloses an optical apparatus with a majority of the limitations of the claimed invention including the Mach-Zehnder as the modulator. However, the reference does not explicitly state how the Mach-Zehnder modulates the optical beam.

On the other hand, it is well known in the art that Mach-Zehnder modulators comprise: a first optical path through a semiconductor substrate through which a first portion of the optical beam is directed; a second optical path through the semiconductor substrate through which a second portion of the optical beam is directed; a plurality of phase adjusting devices to selectively adjust a phase difference between the first and second portions of the optical beam in response to the phase adjustment of the signals;

an optical confinement region disposed in the semiconductor substrate between the first and second optical paths so as to optically isolate the first optical path from the second optical path until the first and second optical paths are merged in the substrate. One of ordinary skill would recognize that there are simply inherent functions of any Mach-Zehnder interferometers. Additionally, it is well known in the art to use acousto-optic, electro-optic, or thermo-optic energy to change the refractive indices of the two arms, such that the relative phase is shifted. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention that the claimed invention would have been met by Lundqvist's disclosure of a Mach-Zehnder interferometer as the modulator (paragraph 49).

In the alternative, Hung discloses an integrated optic device for optical wavelength selection that teaches the limitation that the Lundqvist reference does not explicitly mention. Hung discloses essentially all the limitations of the claimed invention including the limitations of claims 2 and 3 (fig. 4). Hung teaches that it is advantageous to use charge-modulated regions (created by electrodes 1314 and others not labelled) to control optical paths (col. 7, lines 57- col. 8, lines 10). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use charge-modulated regions to control refractive indices in the device disclosed by Lundqvist.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lundqvist and Hung in view of Gill U.S. Patent No. 6,172,791. Refer to the appropriate drawings or parts of the specification. Lundqvist and Hung as applied above, disclose an optical

device with a majority of the limitations of the claimed inventions. However, the references fail to mention the type of electrodes used in the device.

On the other hand, Gill discloses an electro-optic modulator with two arms (Mach-Zehnder) as used in both Lundqvist and Hung. Specifically regarding claim 4, Gill teaches the use of trench capacitors to change the refractive index of the different path arms (fig. 14, electrodes 61). Gill teaches that this is advantageous because it is easier to fabricate (col. 4, lines 9-20). Additionally, one of ordinary skill in the art would recognize that any two parallel electrodes (disclosed in Hung) comprise a capacitor. Therefore, it would have been obvious to one of ordinary skill in the art to use trench capacitors as a means of applying a electro-optic charge to the two different paths of the modulator in Lundqvist and Hung.

Claims 14-16, 18, 20, and 27 rejected under 35 U.S.C. 103(a) as being unpatentable over Lundqvist in view of Sarlet European Patent Application Publication 1 094 574. Refer to the appropriate drawings or parts of the specification. Lundqvist as applied above, discloses an optical device with a gain medium, tunable Bragg grating, and modulator, along with a majority of the limitations of the claimed invention. However, the reference fails to disclose a splitter for splitting the optical signal from the gain medium.

On the other hand, Sarlet discloses a widely wavelength tunable integrated semiconductor device and method that teaches the limitation that the Lundqvist reference fails to mention. Specifically regarding claims 14-16, 18, 20, and 27, Sarlet

discloses an optical splitter (fig. 3 and 8, 730) optically coupled to receive the optical beam, the optical splitter to split the optical beam (from the gain medium, 700) into a plurality of beams, wherein a plurality of Bragg gratings (710, 720) disposed in the semiconductor substrate are optically coupled to the optical splitter to receive a respective one of the plurality of beams and tune the output wavelength. Sarlet teaches that it is advantageous to use a splitter with separate tunable Bragg gratings, because it allows different output wavelengths to be tuned from each grating (col. 10, lines 15-50). One of ordinary skill in the art would recognize that the teachings of Sarlet could be applied to the device disclosed by Lundqvist to arrive at the claimed invention. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to split the gained signal in Lundqvist in order to tune each split signal individually for subsequent individual modulation.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lundqvist in view of Liu U.S. Patent Application Publication No. 2002/0197011. Refer to the appropriate drawings or parts of the specification. Lundqvist as applied above, discloses an optical device with a majority of the limitations of the claimed invention. However, the reference does not explicitly disclose that the Bragg grating index perturbations are comprised of regions of silicon and polysilicon.

On the other hand, Liu discloses a tunable Bragg grating, such as the one used in Lunqvbist, wherein the index perturbations are comprised of periods of silicon and polysilicon (paragraph 17). Liu teaches this is advantageous, because silicon and

polysilicon have a large temperature variation allows the gratings to be tuned with ease (paragraph 28). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use silicon and polysilicon for the index perturbations of the Bragg grating in Lundqvist.

Claims 11 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lundqvist in view of Kapany U.S. Patent No. 6,480,513. Refer to the appropriate drawings or parts of the specification. Lundqvist as applied above, discloses an optical device with a majority of the limitations of the claimed invention. However, the reference fails to mention that temperature can be used to tune the gratings.

On the other hand, Kapany discloses a tunable external cavity laser that teaches the limitation the Lundqvist reference lacks. Regarding claims 11 and 23, Kapany discloses a tunable Bragg grating, such as the one utilized in Lundqvist, wherein the grating is tuned by changing the temperature (fig. 1). Tuning gratings using temperature to change the refractive index of a thermo-optic material is well known in the art. Additionally, Kapany teaches that it is advantageous to use a means of adjusting the temperature of the grating to tune the wavelength, because it allows the pitch of the grating to vary with the temperature (col. 2, lines 5-40). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use a temperature adjusting means to tune the grating of Lundqvist.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Sahara U.S. Patent Application Publication No. 2003/0091086 discloses a tunable laser device for avoiding optical mode hops, wherein the device includes a gain medium, tunable grating, and modulator.

Wipiejewski U.S. Patent Application Publication No. 20030025976 discloses a tunable electro-absorption modulator including a gain medium, tunable grating, and modulator.

Singh U.S. Patent Application Publication No. 2003/0099018 discloses a digital network architecture, including gain mediums, tunable gratings, and modulators, that is especially relevant to the claimed invention.

Deacon U.S. Patent Application Publication No. 20030086655 discloses a wavelength tunable device including a gain medium and Bragg gratings, wherein the gratings are tuned using temperature adjusting means.

The prior art documents submitted by the applicant in the Information Disclosure Statement filed on Febuary 25, 2002, have all been considered and made of record (note attached copy of form PTO-1449).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel E Valencia whose telephone number is (703)-305-4399. The examiner can normally be reached on Monday-Friday 9:30-6:00.

The fax phone numbers for the organization where this application or proceeding is assigned are (703)-308-7724 for regular communications and (703)-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-308-0956.

DEV
July 31, 2003

John D. Lee
Primary Examiner